

THREATS TO RESEARCH PROJECTS ACROSS THE PROJECT LIFE CYCLE

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ABSTRACT

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The article presents the results of research carried out at Wrocław University of Science and Technology related to the project titled "Identification of success and failure factors of research projects." The project included structured interviews with project managers and other stakeholders. Based on the given answers, threats to research projects that occur in different phases of project life cycle were identified (in the Initiating and Defining phase, Executing and Monitoring phase, Project Closing and Settlement phase). Therefore, the purpose of this article is to identify the threats to research project across the project life cycle. The objects of study are research projects, which significantly differ from other types of projects (e.g. investment projects). Different types of threats linked to each phase of the project were identified by respondents during in-depth interviews. In the Initiating and Defining phase as well as in the Executing and Monitoring phase, the most significant threats were connected to team competencies and human resources as well as mistakes in the planning process. However, in the Project Closing and Settlement phase, the greatest threat is related to create ineligible costs which are usually and effect of mistakes in earlier phases.

KEY WORDS

project, success, failure, stakeholder.

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Introduction

The literature review showed that although in the last 20 years much has been written on the subject of managing research projects, the knowledge of the subject is not greatly varied and it still lacks in-depth research in this area. Research projects usually aim to verify the hypothesis. Due to the nature of the research, in the majority of projects, there is an issue with the planning stage. It is usually impossible to know exactly what will be the result of conducted experiments, whether the hy-

pothesis will prove to be true, or whether a method exists. At the initial stage, there is usually lack of knowledge of what will be needed to achieve the planned results, because, in the course of research, new approaches and circumstances may appear impeding the implementation of previous assumptions. Moreover, research projects are uniquely unrepeatable. The aim concentrates on creating innovating results. Even if the project seems not to be routine, the environment and conditions for

their implementation are never the same as before (i.e. situation when researchers use the same chemicals as always, but the conditions of economic and market cause the change in the price of ordered products) (Jastrzębska et al. 2016). Furthermore, what constitutes difficulty, is the difference of perspectives. Procaccino and Verner (2002) highlight stakeholder differences when they are asked about their perceptions of the success of a project. Some researchers (Linberg 1999; Berntsson-Svensson, Aurum 2006) claim that projects success and important factors for project success are perceived differently among different industry domains and different cultures and countries. This variety of perspective explains the reason why the same project could be considered as a success by one and as unsuccessful by another (Lim, Mohamed 1999).

1. Definition of research project and its characteristics

A research project is a specific research task, planned to be solved under agreed conditions, in given period (Ustawa 2004). It concerns research activities which are undertaken with the intention of gaining new knowledge oriented to apply it in practice (applied research) or for not direct usage in practice (theoretical or experimental research) (Dżęga 2009). The term – research project can be used for defining research and development (R&D) activities. It should be addressed to the category of research and development interpreted as (Rzempala et al. 2015):

- acquire new knowledge (research) and use it to acquire various kinds of effects for example devices (development),
- localization of truth (research) and localization of utility (development).

The key feature of research projects is undoubtedly the variability of the scope, but also the high level of uncertainty and risk associated with their conducting and the result (Betta, Klaus-Rosińska 2013). The unique and innovative nature of research projects is emphasized by the difference in the project's objectives, its evaluation and the level of independence of project members (Kuchta, Skowron 2014; Dżęga 2009).

The characteristics that distinguish research projects from other project types can be (Dżęga 2009):

- high costs of the initial phases of project life cycle,
- difficulties with planning results,
- undefined assumptions and requirements regarding the final form of the project,
- complications in estimating workload.

The 'Research project' can be a project about basic research and research & development projects (R&D), as well as industrial research. They are conducted by universities, academic schools and in cooperation with knowledge institutions and enterprises. In Poland, they are funded or co-funded by Polish public (e.g. National Centre of Science (NCN), National Centre of Research and Development (NCBiR)) or the EU funds and programmes (e.g. Horizon 2020 or early 6 or 7 Frame Programme, Innovative Economy Operational Programme).

2. Project management and life cycle

Project management concerns various aspects. First of all, project management can be perceived in an instrumental aspect. The aspect concerns the use of techniques and methods to conduct projects. These are techniques and methods for developing material and abstract systems,

but also for solving problems. Secondly, projects can be managed in a functional aspect, by conducting specific functions in a project. These functions can be planning, control, and coordination. Institutional aspect is the creation of a group of people who will carry out the project. The head of the group should be the coordinator or manager. The last aspect is the social one, which is related to choosing the person best suited for a managerial position. The choice of such a person should depend on predispositions and personality but also professional characteristics (Pawlak 2001).

Project management is related to the concept of the life cycle. The project life cycle divides it into phases/stages to facilitate the project manager's monitoring and control. According to NCB (National Competence Baseline), developed by IPMA (International Project Management Association), project phases/stages are separate periods, which form a project sequence and are separated from other periods. For each phase/stage, specific goals, time limit, and project sub-products are defined (Dalkowski et al. 2009).

There are many models of the project life cycle, while the most general one identifies three types of phases: the initial phase, intermediate phase and final phase of the project (Bosschers 2003). Most of the life cycle models of projects are characterized by:

- low usage of resources at the beginning, which increases with time, and in the final phase sharply decreases,
- low probability of success at the beginning, and therefore a high risk of failure, in the course of time the probability of success increases,
- decreasing ability of customers to influence the final performance of the product. This is obvious when one takes into account the fact that the cost of change and error correction is

increasing at each subsequent phase of the project (Bosschers 2003).

Moreover, each project management methodology offers a slightly different division into project management phases, but they always fit into the general model. For example, the PMBoK methodology (Project Management Body of Knowledge), developed by PMI (Project Management Institute), divides project management into five process groups: Initiating, Planning, Executing, Monitoring and Controlling, Closing (PMI 2013). For comparison, according to the PRINCE2 methodology (Projects in Controlled Environments), the life cycle of a project consists of 7 phases: Starting up a Project, Initiating a Project, Directing a Project, Controlling a Stage, Managing Product Delivery, Managing a Stage Boundary, Closing a Project (OGC 2009). Pinto and Slevin (1988) are the researchers who have studied the success and failure factors according to project life cycle. They identified the following phases: Conceptual, Planning, Execution, Termination.

3. Life cycle and research project management

In the context of research projects, the life cycle is defined in the same way as for other project types, the division into phases depends on the specific creators of life cycle model. For example, in the report "Research project management," developed within cooperation of selected Polish universities (Mesjasz-Lech et al. 2015), appear phases such as "planning," "implementation" and "project completion." In the publication "Management of R&D projects in the industry sector" (Gryzik et al. 2012), developed under the project of Polish Ministry of Science and Higher Education, the starting phase of R&D projects is divided into "project initiation" and "project planning".

However, that what distinguishes management of research projects from the management of other project types is management in the instrumental, institutional and social aspect. Choosing the right management concept that would fit the needs of the research project is not simple. There is a conviction that research projects should be managed differently, but the choice of project management concepts is not fully justified. This has been documented by, among others: Liberatore, Kjolhede, Shenhar and Larsen (Kuchta et al. 2015; Kuchta, Skowron 2015). In the literature, it is possible to find recommendations for the management of research projects based on traditional project management methods. For example, Turner and Cochrane (Turner, Cochrane 1993) proposed a matrix (based on the criterion of opportunity for defining project goal and the criterion of the opportunity for defining research methods), because of which it became possible to choose the appropriate breakdown structure (OBS, WBS, PBS) to manage the project configuration. Some literature sources recommend the use of Agile Methodologies for managing research projects (Klaus-Rosińska, Skowron 2012; Spalek, Zdonek 2013).

The questionnaires were used to obtain the results of research presented in this article. The project team developed and used three questionnaires: (1) a survey for research project managers (online version), (2) a questionnaire for in-depth interviews with research project managers and (3) a questionnaire for in-depth interviews with stakeholders other than research project managers. Both questionnaires for in-depth interviews (2), (3) in their structure are based on the specific project life cycle, which divides research project management into the following phases: Initiating and Defining Phase, Executing and Moni-

toring Phase, Project Closing and Settlement Phase.

4. Criteria for success and failure of research projects

Success is described in the literature in many different ways based on different criteria. Traditionally the literature refers to three basic criteria for successful projects called Iron/Golden Triangle: cost (i.e. Cheng et al. 2012; Pinto, Slevin 1988; Lim, Mohamed 1999; Atkinson 1999; DeCotiis, Dyer 1979; Morris et al. 1987; Wateridge 1998), time (i.e. Cheng et al. 2012; Pinto, Slevin 1988; Lim, Mohamed 1999; Atkinson 1999; DeCotiis, Dyer 1979; Morris et al. 1987; Wateridge 1998) and quality (i.e. Lim, Mohamed 1999; Atkinson 1999; Wateridge 1998; Pinto, Slevin 1988), although the role of stakeholders is increasingly mentioned (i.e. Lim, Mohamed 1999, Wateridge 1998, Camilleri 2011). Moreover, Wateridge (1998) noticed that success and failure are seen as *black and white* very often. It seems not right because projects may not always be seen as completely successful or complete failures and different participants may see the outcome of the same project in a different way (Wateridge 1998; Morris et al. 1987; DeCotiis, Dyer 1979; Chan, Chan 2004).

Some authors claim that project success means that results must be even better than expected or observed in other similar projects regarding cost, schedule, quality, safety, and satisfaction of the participants (Ashley et al. 1987). However some researchers, e.g. Pinto, Slevin 1988; Shenhar et al. 1997; Atkinson 1999; Gardiner, Stewart 2000; Wateridge 1998, criticized Golden Triangle as an insufficient, inadequate, and not enough (although Yu et al. 2005 emphasized this approach reduces dimensions of project success). There is also discussion about time – if it is

a separate criterion or merely a variable in the project cost function – as a result, time is not an independent variable and should not be used as such to measure project success. Cheng et al. 2012 consider only two factors: time and budget. Although Baker et. al. (1983) outlined that project success or failure is not a function of time and cost. Nevertheless, while considering stakeholders perspective, there is a wide variety of criteria for evaluating the success of projects (i.e. Lim et. al. 1999; Atkinson 1999; Chan, Chan 2004). It is also worth noting the fact that the proper management of the project can contribute to its success. However, it is not able to prevent its failure. It is also significant to mention that, to what extent the primary objectives of the project will be met, determines the success or failure of the project. That is way De Wit (1988) proposed a distinction between two concepts: the success of a project as a whole and the successful management of the project. He also noticed that the criteria for project management are often limited to the cost, schedule, and quality of management while projects are classified

as successful above all when the needs of various project stakeholders are satisfied in each stage of project life cycle and by all project management levels. Therefore, it can be concluded that with such a multitude of objective measurement of the project, success may prove to be illusory (Jastrzębska et al. 2016).

5. The basic concept of project success factors

Since the 1980s many articles about the success factors and the failures of projects have been written (i.e. Lewis 2003; Young, Jordan 2008; Blumer et al. 2013; Camilleri 2011; Zwikael 2008; Fortune, White 2006; Appelbaum 2004; CERF 2004; Kanter, Walsh 2004; Nelson 2007, Bizan 2003; Frese, Sauter 2003; Charvat 2002; De Wit 1988; Belassi, Tukul 1996; Tukul, Rom 1995; Morris, Hugh 1987; Pinto, Slevin 1988; Morris 1986). Literature concepts have some similarities and differences, but there is a possibility to distinguish projects success factors – as an example, Fortune and White (2006) proposal is presented in Table 1.

Table 1. Project success factors in literature

Project attribute	Project success factors in literature
Goals and objective	Clear, realistic objectives Strong business case/sound basis for the project
Performance monitoring	Effective monitoring/control Planned close down/review/acceptance of possible failure
Decision makers	Support from senior management Competent project manager Strong/detailed plan kept up to date Realistic schedule Good leadership Correct choice/ experience of project management methodology/ tools
Transformations	Skilled/suitably qualified/sufficient staff/team
Communication	Good communication/feedback
Environment	Political stability Environmental influences Experience (learning from) Organizational adaptation/culture/structure
Boundaries	Project size/level of complexity/number of people involved / duration

Resources	Adequate budget Sufficient / well-allocated resources Training provision Proven/familiar technology Good performance by suppliers/contractors/consultants
Continuity	Risk addressed/assessed/managed User/client involvement Different viewpoints (appreciating) Effective change management

Source: Fortune, White 2006.

For the scientists, the success of the project means the correct implementation of the project – it means the fulfillment of the schedule and budget, but also the presentation of the project results at conferences (Jastrzębska et al. 2016). Three different groups of stakeholders, with a different point of view on projects success, can be distinguished according to Egorova et al. (2009). Stakeholders of the first group are interested mainly in revenue and customers since their work is evaluated depending on the returns from the investments and economic benefits for the company. The second group is concerned about schedule and budget; they are judged by delivery precision and project cost. Stakeholders of the third group deal with artifacts and their work is mainly evaluated upon the quality of the final product. Some authors concentrate on open and honest communication among stakeholders as a factor of project success (Lewis 2003). It can be said that this factor is very important if the project has many partners from different countries, and it is the challenge to work on the project (Urstad 2005). In Bizans' (2003) opinion, the size and form of organizational partners of the research project have an impact on its technical success and commercialization of products during the duration of the project: he connected the probability of technical projects success with duration, partners' ownership, as well as complementary capabilities of partners. The second correlation is between the time of commercialization of results and budget,

the income of companies and property law. The characteristics of organizations from different countries cover issues such as communication, standard approaches to problem solving, hierarchy, structure work. That is the reason why many authors underline the role of project manager (skills, experience, understanding organizational procedures) and team members (Zwikael 2008; Fortune, White, 2006). The same authors claim that support from the board of the organization and the external environment are very important criteria. As one can observe, the involvement of senior management is the main ingredient in the recipe for success of the project – it is connected with their competencies from different areas of management (soft and hard), knowledge, experience (i.e. Chow, Cao 2008; Fan 2010; Zwikael 2008). Sometimes, support of administration and relations among team members prove to be the most important critical factors, leading to a higher level of project manager's satisfaction and ultimately to the success of the whole project (Mahmood et al. 2014; Young, Jordan 2008). Nelson (2007) and Napier et al. (2009) specified the competence, interest, and cooperation of team members as the main factors of the projects success. Also, it was found that for the prestige of the project, important factors are competence, commitment, and satisfaction of team members. The failure of the project depends on the existence of obstacles of a political nature, the lack of ease of

obtaining funds and unsatisfactory cooperation with the administration (Jastrzębska et al. 2016).

6. Empirical research results

The research was carried out in the framework of a project funded by the National Science Centre [“Czynniki sukcesu i porażki projektów badawczych. Studium przypadków Polski („nowa” Unia) i Francji („stara” Unia)”, nr 2014/13/B/HS4/01660]. The aim of the project is to identify factors of success and failure of research projects. The study was conducted as series of extended interviews with managers of research projects and other stakeholders of research projects. The direct objective of the interviews was to obtain representative information on the topic of research projects management, its success, and

challenges. This article is focused only on stakeholders different than a project manager.

In the project, the PMI (Project Management Institute) definition of “stakeholders” is adopted as: ‘an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project’ (PMI 2013). These stakeholders may be inside or outside an organization, they can be a project sponsor or they can have an interest in a successful completion of a project, or they may have a positive or negative influence on the project completion. Such definition allows looking at the stakeholders in a wider perspective. According to the above-mentioned definitions, the types of research project and stakeholders were identified in the project. They are presented in Table 2.

Table 2. Types of stakeholders of research projects in universities/schools (state of April 2017)

No.	Type of research project stakeholders	No. of answers from Interviews
1.	Project manager	more than 60
2.	Project team	0
3.	Administrative units supporting research project implementation (central level)	12
4.	Administrative units supporting research project implementation (departmental level)	2
5.	The authorities of the university/school implementing research project (central level)	0
6.	The authorities of the university/school implementing research project (departmental level)	0
7.	Institutions funding research projects	0
8.	Potential recipients of project results	0
9.	Cooperating institutions (collaborators)	2
10.	Advisory (consultative) institutions	2

Source: Own elaboration.

Only the preliminary quantitative and qualitative results of research are available now because the project team still carries on the in-depth interviews with stakeholders (including the project managers). The results for the project managers

(Jastrzębska et al. 2016) and other stakeholders (Klaus-Rosińska, Kuchta 2016) were published separately. Therefore, in next part of this article, ‘stakeholders’ are understood as those, who are not the project managers. This division is justified

by a competence-related issue because the stakeholders and the project managers have different points of views on the same project aspects. 19 in-depth interviews were completed with such defined stakeholders and more than 60 in-depth interviews with the project managers. The largest research sample of stakeholders was obtained from workers of administrative units supporting the research project implementation on the central level (12 people). This fact is a key for interpreting data set.

Taking into consideration the aims of this article, it will focus on the opinions of the stakeholders who are not the project managers as related to the three following issues: (1) what criteria are the most or the least important for the success of research projects, (2) what success and / or failure factors are important for research projects and (3) what typical threats take place during each research project phase.

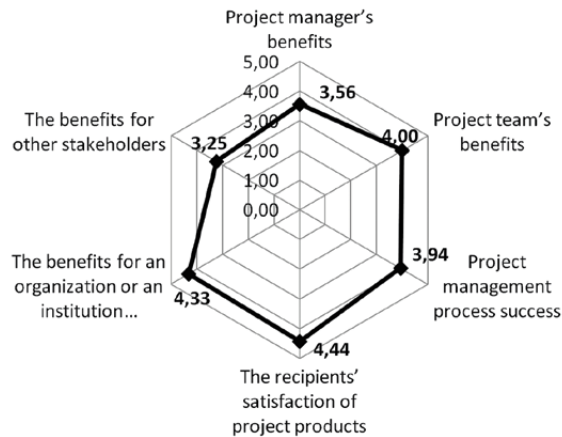
Basing on literature and research team's experiences, a list of typical successes and failures of the research project were formulated. Additionally, respondents could define themselves success and failure factors, what gives a wider view about this issue. In the project the term 'threat' was defined similarly to PMBoK Guide, where 'threat' is defined as conditions or unfavorable situation for the project, unfavorable set of circumstances, a sequence of events, risk which would influence project (its aims) negatively if it occurs. 'Threats' usually are understood as some random events coming from the environment (compare to SWOT analysis) which are a source of risk (in negative meaning). However, threats can come from the inside of project (e.g. workers), not only from the project environment. The threat has a different meaning than the risk. The risk could be calculated after events. When the his-

tory of events is known, the risk can be calculated. Moreover, there are current threats and future ones. Identification of threats (potential events in the future) helps to define risk. Surely, the terms 'threat' and 'risk' are correlated, but they are not interchangeable words, although the threat is a part of the risk. The sources of risk are threats. Basing on in-depth interviews, only threats were identified, not the probability of negative events (risk). In the third part of the questionnaire, the respondents were directly asked to point the threats and other problems connected with the carried out project. The threats were also identified based on other questions, focusing on sources of the project failures.

6.1. Criteria for success of research projects

Researched stakeholders assessed six criteria, which were earlier identified based on literature (Figure 1), for evaluating the success of the research project. The validity was determined on a 6-point scale (from '0' to '5', where '0' means unjustified criterion; '1' - very little justification of criterion and '5' - very much justified criterion). Basing on the points given by the stakeholders, the average measure was calculated for each criterion as an arithmetic average. This calculation is the same as the weighted average of each criterion. Theoretically, all the values vary from 0 to 5. The results are shown in Figure 1.

Figure 1. The weighted average of each criterion for evaluating the success of the research project in stakeholders' opinion



Source: Own elaboration.

It can be concluded that all separated criteria are important for evaluating the success of the research project (average value > 3), but the most important criteria are: 'The recipients' satisfaction of project products' and 'The benefits for an organization or an institution running the research project.' In stakeholders' opinions, 'The benefits for other stakeholders' and 'Project manager's benefits' are the least justified criteria. The hypothesis (H1) that each stakeholder maximizes its benefits (utility function)¹ can be proposed, which is coherent with the assumption of orthodox economics.

6.2. The success and failure factors for research project

In the questionnaire for in-depth interviews, the stakeholders evaluated 48 success and failure factors for the research projects (identified according to the literature). These factors were assigned to the nine project-related attributes presented in

table 1. The stakeholders answered if the factors are or are not important for them. Next, they pointed out if the analyzed factor can have some influence on project or not. They had to mark the answer on the scale, where the following numbers have respectively meaning:

- '0' - the factor does not have any influence (on project),
- '1' - the factor can have very little influence,
- '2' - the factor can have little influence,
- '3' - the factor can have some influence,
- '4' - the factor can have much influence
- '5' - the factor can have very much influence.

Based on the assigned points, the average value ($\bar{X}$) was calculated for each factor and it is presented in table 3. Additionally, standard deviation (σ) was estimated, which informs about the differentiation of opinions between stakeholders. The coefficient of variation (V) allows to compare

¹ The H1 could be statistically verified after finishing our depth-interviews.

the diffusion degree of the stakeholders' opinion about success and/or failure factors. It is calculated according to the formula (1):

$$V = \frac{\sigma}{\bar{x}} \quad (1)$$

If the average value of analyzed factor is closer to the value of 5, then the factor is more important for success or failure of the project, of course in stakeholders' opinion.

It means that it has a strong influence on the success/failure of the project and if the factor is unreachable, the threats for the research project are bigger. For example, the average value for the factor called 'The realistic project aims' achieved the highest value, so one can say that if the project aims are unrealistic, the research project is at risk and it may fail.

Table 3. Success and/or failure factors for research projects and the key statistical parameters

No	Factor	Average value	Standard deviation	Coefficient of variation
1	Clearly defined project aims (managing by objective)	4,74	0,56	0,12
2	The realistic project aims (i.e. relatively easy to complete)	4,89	0,32	0,07
3	The identification of the project stakeholders with its aims	3,63	0,96	0,26
4	The definition and the application of the project aims indicators for evaluating the project flow	4,00	0,73	0,18
5	Carrying out the analysis of stakeholders influences the project	3,15	1,28	0,41
6	The access to resources needed to complete the project	4,68	0,48	0,10
7	The proper division of the duties in the project	4,64	0,61	0,13
8	The proper allocation of resources to particular project task	4,69	0,48	0,10
9	The realistic schedule	4,42	0,61	0,14
10	The realistic budget	4,37	0,68	0,16
11	Risk management in the project (Project risk management)	3,79	0,98	0,26
12	Constant monitoring and control of the project plane completion	4,17	0,71	0,17
13	The application of existing methods / techniques for project management	3,42	1,07	0,31
14	The application of IT tools for project management	3,53	0,72	0,20
15	The formal management of project changes	3,11	1,45	0,36
16	The project manager's experience in similar poste	4,28	0,83	0,19
17	The knowledge and the skills of the project manager as related to the project management	4,22	1,06	0,25
18	The project manager's involvement	4,58	0,69	0,15
19	The project manager's skills in responding to changes	3,95	1,27	0,32
20	The project manager's communication skills	4,11	0,81	0,20
21	The project manager's leadership	3,79	1,23	0,32
22	The project manager's skills in assigning tasks (and the related rights)	3,84	1,17	0,30
23	The project manager's authority	3,79	1,23	0,32
24	The accuracy of project manager's decisions	3,74	1,33	0,36
25	The project manager's negotiation skills	3,63	1,38	0,38
26	The project manager's awareness of possible project failure	3,84	1,34	0,35
27	The right number of people in the project team	3,77	0,75	0,20
28	The proper knowledge and skills of the project team members	4,61	0,61	0,13
29	Team-work skills	4,00	1,19	0,30
30	The project team's experience in carrying out projects	3,67	1,24	0,34
31	The project team members' involvement	4,21	1,23	0,29
32	The sense of responsibility for the project results by the team members	4,47	0,64	0,14

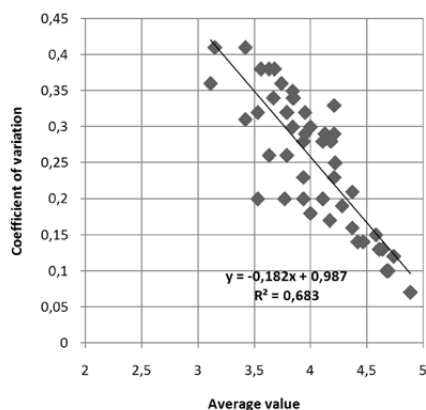
33	The team members communication skills	3,94	0,90	0,23
34	The discussions about project problems	3,94	1,09	0,28
35	Good relations between the team members	3,94	0,77	0,20
36	Creative atmosphere	3,84	1,30	0,34
37	The project team is aware of possible project failure	3,95	1,13	0,29
38	The presence of an organizational unit supporting the project management	4,13	1,20	0,29
39	Competent and supporting team for project administrative management – central level of organization	4,18	1,19	0,28
40	Competent and supporting team for project administrative management – the lower level of organization (e.g. faculty level, department level)	4,11	1,15	0,28
41	Administrative staff training as related to the project management	3,85	1,33	0,34
42	The stability of regulations and guidelines related to projects realization	4,21	0,98	0,23
43	The top managers support at /on central level	3,42	1,39	0,41
44	The managers support at /on lower level of organization (e.g. faculty level, department level)	3,68	1,42	0,38
45	Good cooperation with suppliers / contractors / consultants	3,53	1,12	0,32
46	The involvement of end-product recipients	3,56	1,34	0,38
47	Good cooperation with project funding-institutions	4,37	0,96	0,21
48	Good cooperation between project coordinator and the projects sub-managers	4,21	1,40	0,33

Source: Own elaboration.

Analogically, the least important factor is 'The formal management of project changes' ($\bar{X} = 3,11$) and it means that formal management is not important to finish the research project successfully. Next issue of data set interpretation is related to coherence of stakeholders' opinions. The dispersion of stakeholders' opinions is measured by the coefficient of variation (V). The respondents are the most coherent in the assessment of factor No. 2 – 'The realistic project aims' ($V = 0,07$), which emphasizes the importance of this factor for project success or failure. The strongest cohesion occurs also for the followed factors: No. 6 – 'The access to resources needed to complete the project', No. 8 – 'The access to resources needed to complete the project'. The least coherent opinions were for such factors as: No. 43 – 'The top managers support at central level', No. 5 – 'Carrying out the analysis of stakeholders influences the project' which confirms that these factors are not considered as big threats for the project if they do not appear. Figure 2 presents the map of success or failure

factors which illustrates the correlation between the coefficient of variation (V) and the average value ($\bar{X}$). The factor is more important when the cohesion of opinions is stronger.

Figure 2. The map of success or failure factors



Source: Own elaboration.

6.3. The main threats in the project life cycle

The stakeholders have listed, among other things, main threats in each project

life cycle. Their views are independent of each other, and they come from their experiences. It is worth mentioning that only one respondent said that he/she has not had many experiences related to the research projects. Others have had numerous experiences over the years. Some stakeholders underlined that the failure in an earlier phase implicates the threats in next phases. Therefore, the initiating and defining phase is a key for the executing phase and so on.

6.3.1. The threats on initiating and defining phase

The threats in this phase were identified basing on two questions concerning (1) difficulties in preparing the process of application and (2) frequent errors in application forms and other documents. The threats factors can be divided into four thematic groups, of which two have additional descriptions, as follows:

- Project team low level of competence in the areas (20²):
 - clear, coherent and logical descriptions of projects and the parts of applications related to the project management and risks (6),
 - knowledge about administrative procedures, current competition documentations as well as skills related to the online application (9)
 - knowledge about innovation levels in the world (2) and foreign language skills on the proper level (1),
 - knowledge of potential partners (2); if the knowledge is little it causes the random selection of partner,
- Mistakes in planning (13):
 - budget and costs (11),
 - results as well as product indicators (2),
 - Haste to prepare the application (6),
 - Unrealistic goals (7).

² The number in brackets informs how many respondents mentioned this threat.

6.3.2. The threats on executing and monitoring phase

The threats in this phase were identified based on the questions linked (1) directly to the project threats, (2) to the problems which appeared in this phase, (3) to the reasons for changes in the project. The threats factors can be divided into some thematic groups as following:

- Human resources at the project level (18):
 - the personal changes in the project team which result from their illnesses, changing their private plans and difficulties in finding a highly-qualified substitute (10),
 - low level of professionalism of the project workers (5), e.g. lack of foreign language skills,
 - lack of the knowledge concerning administrative regulations and procedures in the mother-organization (3),
- Mistakes in planning (20):
 - time for realization (7),\
 - budget and costs (8)
 - not serious approach to the planned process of research (5),
- Partners (7), e.g. they bankrupt, problems with communication, completing tasks behind the schedule,
- Complicated procedures at organization level (5),
- Unreachable project objectives (4), which can be caused by different reasons as too ambitious aims, the mistakes of workers,
- Unpredictable and uncertain project results (2) – it is connected with science matter.
- Changes on the market mainly caused by increased prices.

Most threats come from the resources and the processes in the organization, not from its environment.

6.3.3. The threats on project closing and settlement phase

The threats in this phase were identified based on one question related to this phase about problems with the final settlement of the project. The most stakeholders mentioned crossing the limit of planned expenditures and costs which create ineligible costs. This aspect was pointed by 12 respondents. The threat of the final settlement of the project was related to formal mistakes which can result in waiting too long for the last payment. Sometimes the institution has to take a loan. Five stakeholders said that the declared tasks have been not completed.

Conclusions

The paper presents the results of research, which aim was to find the project success/failure factors for the research projects in Poland. The literature research shows that the evaluation of the project' success may vary depending on the viewpoint, but the most popular criteria are quality, costs and time. Obviously, success means much more than the 'gold triangle,' but for different groups of stakeholders, those three criteria usually means a lot. However, the research shows that for research project time and cost are pointed most frequently while talking about failures factors. Moreover, as the presented research results showed, some criteria pointed out as most significant for project success, and failure can be distinguished although each research project is unique and unrepeatable. It is important that the respondents agreed about the fact that the most meaningful success factors are human resources skills and management (mainly planning) in the executive phase. The lack of knowledge about administrative procedures, current competition documentation as well as the lack of skills related to online application

is also very important factors for project success, because they may affect the lack of financing, the proper execution and the lack of project settlement. The most important factors are connected with clearly defined aims³, resource planning (particularly the initiation phase is the most important) and monitoring of the work progress with the management of changes. Based on this information, further research may lead to the development of such methods of research projects management that will facilitate their efficient and effective management.

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References

- Appelbaum, S.H. (2004), Critical success factors in client-consulting relationships, *The Journal of American Academy of Business*, 4(1/2): 184-191.
- Ashley, D.B., Laurie, C.S., Jaselskis, E.J. (1987), Determinants of construction project success, *Project Management Journal*, 18(2): 69-79.
- Atkinson, R. (1999), Project management: Cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria, *International Journal of Project Management*, 17(6): 337-342.

³ Some respondents said that the project aims are too ambitions. Often, they stem from competition guidelines, because the authors of application would like to match the project goals to the assessment criteria. Basing on the observation and the made interviews, obtaining the grant is the most important aim in the initiating-and-defining phase.

- Baker, B.N., Fisher, D., Murphy, D.C. (1983), Project management in the public sector: Success and failure patterns compared to private sector projects, *Project Management Handbook* (2nd edition): 920-934.
- Belassi, W., Tukel, O.I. (1996), A new framework for determining critical success/failure in projects, *International Journal of Project Management*, 14(3): 141-151.
- Berntsson-Svensson, R., Aurum, A. (2006), Successful software project and products: An empirical investigation, *Proceedings of the 2006 ACM/IEEE International Symposium on Empirical Software Engineering* ACM: 144-153.
- Betta, J., Klaus-Rosińska, A., (2013), Pomiar i ocena efektywności projektów badawczych, *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia*, 59(760): 39-47.
- Bizan, O. (2003), The determinants of success of R&D projects: Evidence from American–Israeli research alliances, *Research Policy*, 32(9): 1619-1640.
- Blumer, Y.B., Stauffacher, M., Lang, D.J., Hayashi, K., Uchida, S. (2013), Non-technical success factors for bioenergy projects – learning from a multiple case study in Japan, *Energy Policy*, 60: 386-395.
- Bosschers, E. (2003), *Zarządzanie projektem: model najlepszych praktyk*, Kraków: IFC Press, Nowe Motywacje.
- Camilleri, E. (2011), *Project success: Critical factors and behaviours*, Farnham, UK: Gower Publishing Ltd.
- CERF (2004), *Independent Research Assessment of Project Management Factors Affecting Department of Energy Project Success – Final Report*, Office of Engineering and Construction Management, U.S. Department of Energy.
- Chan, A.P.C., Chan, A.P.L. (2004), Key performance indicators for measuring construction success, *Benchmarking: An International Journal*, 11(2): 203-221.
- Charvat, J.P. (2002), How to identify a failing project, available at: www.uk.builder.com/manage/project/0,39026588,20269989,00.htm (accessed 1 June 2009)
- Cheng, M.Y., Tsai, H.Ch., Sudjono, E. (2012), Evolutionary fuzzy hybrid neural network for dynamic project assessment in construction industry, *Automation in Construction*, 21: 46-51.
- Chow, T., Cao, D.B. (2008), A survey study for critical success factors in agile software projects, *The Journal of Systems and Software*, 81: 961-971.
- Dałkowski, B., Staśto, L., Zalewski, M. (Eds.) (2009), *NCB. Polskie wytyczne kompetencji IPMA (wersja 3.0)*, Warszawa: Stowarzyszenie Project Management Polska.
- DeCotiis, T.A., Dyer L. (1979), Defining and measuring project performance, *Research Management*, 22(1): 17-22.
- De Wit, A. (1988), Measurement of project success, *International Journal of Project Management*, 6(3): 164-170.
- Dżega, D. (2009), Projekty badawcze, in: W. Olejniczak (Ed.), *Zespół – Kultura – Projekt*, Szczecin: Wydawnictwo ZPSB.
- Egorova, E., Torchiano, M., Morisio, M., Wohlin, C., Aurum, A., Svensson, R.B. (2009), Stakeholders' perception of success: An empirical investigation, 5th Euromicro Conference on Software Engineering and Advanced Applications IEEE Xplore: 210-216, available at: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5349848> (accessed 10 November 2016).
- Fan, D. (2010), Analysis of critical success factors in IT project management, *Proceedings of the 2nd International Conference on Industrial and Information Systems (IIS) 10-11 July 2010, Dalian, China*, IEEE Xplore: 487-490, available at: <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5565760> (accessed 10 November 2016).
- Fortune, J., White, D. (2006), Framing of project critical success actors by a systems model, *International Journal of Project Management*, 24: 53-65.

- Frese, R., Sauter, V. (2003), Project success and failure: What is success, what is failure, and how can you improve your odds for success, available at: http://www.umsl.edu/~sauterv/analysis/6840_f03_papers/frese/ (accessed 15 November 2016).
- Gardiner, P., Stewart, K. (2000), Revisiting the golden triangle of cost, time and quality: the role of NPV in project control, success and failure, *International Journal of Project Management*, 18: 251-256.
- Gryzik, A., Knapieńska, A., Tomczyńska, A. (Eds.), (2012), Zarządzanie projektami badawczo-rozwojowym w sektorze przemysłu, Warszawa: Ośrodek Przetwarzania Informacji oraz Ministerstwo Nauki i Szkolnictwa Wyższego.
- Jastrzębska, J., Walecka-Jankowska, K., Kuchta, D. (2016), Project success factors: Research results, Decisions in situations of endangerment: research development, In: D.Kuchta, M.Popławski, D.Skorupka, S. Stanek (Eds), Wrocław: Publishing House of the General Tadeusz Kościuszko Military Academy of Land Forces, cop.: 151-167.
- Kanter, J., Walsh, J.J. (2004), Toward more successful project management, *Information Systems Management*, 21(2): 16-21.
- Klaus-Rosińska, A., Kuchta, D. (2016), The success and failure of research projects according to the opinions of various stakeholders, in: L. Gómez Chova, A. López Martínez, I. Candel Torres (Eds.) *Conference Proceedings of the 9th International Conference of Education, Research and Innovation ICERI 2016*, 14-16 November, Seville, Spain (pp. 1947-1956), Valencia: IATED Academy.
- Klaus-Rosińska, A., Skowron, D. (2012), Zastosowanie metodyk zwinnych do zarządzania projektami badawczymi szkół wyższych, in: D. Kuchta (Ed.), *Nauka i praktyka w zarządzaniu projektami: Project Management Excellence Forum*, Wrocław, Tempo: 17-31.
- Kuchta, D., Skowron, D. (2015), Classification of R&D projects and selection of R&D project management concept, *R&D Management*, 46(5): 831-841.
- Kuchta, D., Skowron, D. (2014), Model romboidalny w zarządzaniu projektami badawczo-rozwojowymi, *Zeszyty Naukowe Wyższej Szkoły Oficerskiej Wojsk Lądowych im. gen. T. Kościuszki*, 1: 201-220.
- Kuchta, D., Gładysz, B., Skowron, D., Betta, J. (2015), R&D projects in science sector, *R&D Management*, 47(1): 88-110.
- Lewis, B. (2003), The 70-percent failure, *InfoWorld*, available at: <http://archive.infoworld.com/articles/op/xml/01/10/29/011029/opsurvival.xml> (accessed 10 February 2014).
- Lim C.S., Mohamed Z., (1999), Criteria of project success: An exploratory re-examination, *International Journal of Project Management*, 17(4): 243-248.
- Linberg, K. (1999), Software developer perceptions about software project failure: a case study, *Journal of Systems and Software*, 49(2-3): 177-192.
- Mahmood, A., Asghar, F., Naoree, B. (2014), Success factors on research projects at university. An exploratory study, *Procedia – Social and Behavioral Sciences*, 116: 2779-2783.
- Mesjasz-Lech, A., Grabowska, M., Grabińska, B., Grabiński, K., Trzpiot, G., Rzempała, J., Sz wajlik, A., Masiarek A. (2015), Zarządzanie projektem badawczym, available at: http://www.ipma.pl/sites/default/files/podr%C4%99cznik_RD_final.pdf (accessed 13 June 2015).
- Morris, P.W. (1986), Project management: A view from Oxford, *International Journal of Construction Management and Technology*, 1: 36-52.
- Morris, P.W., Hugh, G.H. (1987), *The anatomy of major projects: A study of the reality of project management*, New York: John Wiley and Sons.
- Napier, N.P., Keil, M., Tan, F.B. (2009), IT project managers' construction of successful project management practice:

- A repertory grid investigation, *Information Systems Journal*, 19(3): 255-282.
- Nelson, R. (2007), IT project management: infamous failures, classic mistakes, and Best Practices, *MIS Quarterly Executive*, 6 (2): 78.
- Office for Government Commerce (OGC) (2009), *Managing successful projects with PRINCE2*, London: The Stationery Office Books.
- Pawlak, M. (2001), *Podstawy zarządzania projektami*, Lublin: Wydawnictwo Politechniki Lubelskiej.
- Pinto, J. K., Slevin, D.P. (1988), Critical success factors in successful project implementation, *IEEE Transactions on Engineering Management*, 34(1): 22-27.
- Procaccino, J., Verner, J. W. (2002), Software practitioner's perception of project success: A pilot study, *International Journal of Computers, The Internet and Management*, 10(1): 20-30.
- Project Management Institute (PMI) (2013), *PMBok Guide (5th edition)*, Warszawa: Wydawnictwo MT&DC.
- Rzempala, J., Pieńkos, M., Leśniowski, T. (Eds.) (2015), *Zarządzanie projektem badawczym*, Kraków: Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.
- Shenhar, A.J., Levy, O., Dvir, D. (1997), Mapping the dimensions of project success, *Project Management Journal*, 28(2): 5-13.
- Spalek, S., Zdonek, D. (2013), Zwinne podejście projektowe a projekty badawcze, *Zeszyty Naukowe Politechniki Śląskiej, Seria: Organizacja i Zarządzanie*, 64(1894): 242-249.
- Tukel, O.I., Rom, W.O. (1995), *Analysis of the characteristics of projects in diverse industries*, Working Paper, Cleveland: Cleveland State University.
- Turner, J.R., Cochrane, R.A. (1993), The goals and methods matrix: Coping with projects with ill-defined goals and/or methods of achieving them, *International Journal of Project Management*, 11(2): 93-102.
- Urstad, J.F. (2005), *Frogs in a wheelbarrow? The role and challenges of the project manager throughout the life cycle of a European Union funded R&D project form the proposal to the completion stage*, PMI Global Congress EMEA 2005, Edinburg, Scotland, May 23-25. EMEA Service Centre, 300, Avenue Ter-vueren, B-1150 Brussels, Belgium, available at: http://www.simula.no/research/nd/publications/Frosturstad.2005.1/simula_pdf_file (accessed 15 October 2007).
- Ustawa z dnia 8 października 2004 r. o zasadach finansowania nauki, *Dz.U.* 2004 nr 238 poz. 2390.
- Wateridge, J. (1998), How can IS/IT projects be measured for success?, *International Journal of Project Management*, 16(1): 59-63.
- Young, R., Jordan, E. (2008), Top management support: Mantra or necessity?, *International Journal of Project Management*, 26 (7): 713-725.
- Yu, A., Flett, P. F., Bowers, J.A. (2005), Developing a value-centred proposal for assessing project success, *International Journal of Project Management*, 23(6): 428-436.
- Zwikaël, O. (2008), Top management involvement in project management: Exclusive support practices for different project scenarios, *International Journal of Managing Projects in Business*, 1(3): 387-403.

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